

WHAT'S HAPPENING (ANALYTICALLY SPEAKING) IN DIAMOND HEAD OIL

Reference:

Halliburton's Nuus

Final Draft / Site Inspection Report / Diamond Head Refinery (12/31/91) [initialed as final by
"AQB"]

299579



PART III: SAMPLING RESULTS

EXISTING ANALYTICAL DATA

The New Jersey Department of Environmental Protection (NJDEP), Division of Waste Management collected six surface soil samples and two surface water samples from areas of visual contamination at the site on May 1, 1985. These samples were analyzed for volatile organics, acid compounds, pesticides, PCBs, metals, cyanides, and phenols. The analytical results for selected compounds are presented in Table 1. A full presentation of the NJDEP analytical results along with a sample location map, is included as Ref. No. 24.

TABLE 1

ANALYTICAL RESULTS FOR SELECTED CONTAMINANTS DETECTED IN SURFACE SOIL SAMPLES COLLECTED BY NJDEP AT THE DIAMOND HEAD OIL REFINERY DIV. SITE ON MAY 1, 1985

Sample Number/Contaminant Concentration						
<u>Hazardous Substance</u>	<u>SBACK</u>	<u>S1</u>	<u>S2</u>	<u>S3</u>	<u>S4</u>	<u>S5</u>
Toluene	ND	36.3	94.9	40,520.4	ND	2,355.7
Benzene	ND	BMDL	45.8	16,960.7	ND	252.7
1,1-Dichloroethane	ND	10.1	20.6	942.1	ND	335.9
Ethylbenzene	ND	18.5	14.2	6,020.4	ND	BMDL
Phenanthrene	7,130	410	BMDL	1,487,000	13,114	36,200
Fluoranthrene	12,025	236	55,100	601,000	16,645	13,800
Pyrene	9,346	349	178,000	1,130,000	13,200	39,100

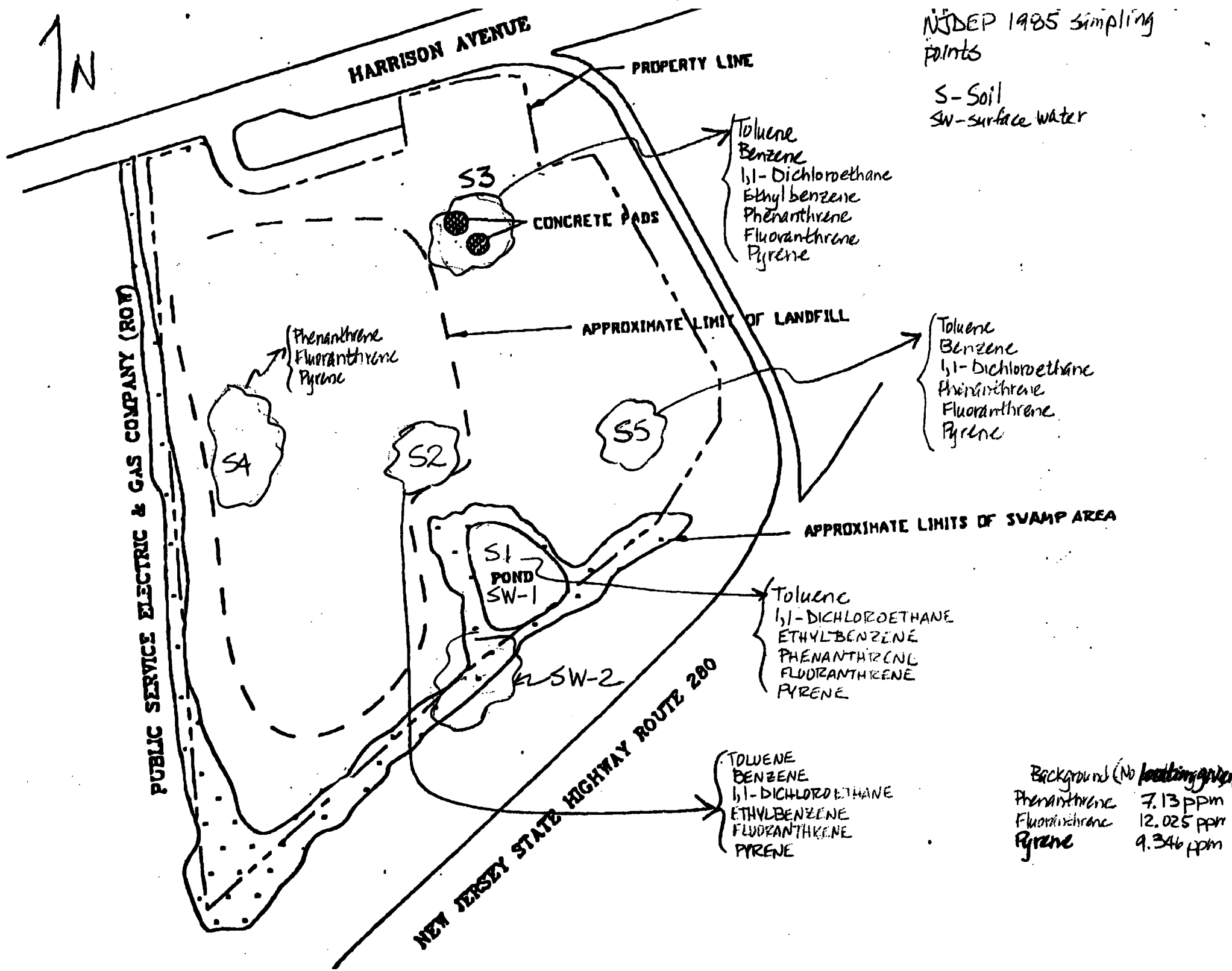
Results in micrograms per kilogram (ug/kg)
BMDL = Below Minimum Detection Limit
ND = Compound Not Detected

Hudson Meadows Urban Renewal Development Corporation (HMURDC) retained Killam Associates to conduct an environmental site characterization of the Diamond Head Site. During this investigation five soil borings and five monitoring wells were installed at various locations throughout the site between October 23 and 31, 1989. Samples were collected during the soil boring process and analyzed for petroleum hydrocarbons and U.S. EPA Priority Pollutants plus 40 library search compounds to characterize subsurface contamination. Analytical results from these samples do not indicate the presence of any contaminant significantly above the contaminant levels obtained from the NJDEP surface soil samples. Killam Associates also sampled four of the five monitoring wells in November 1989 and again in January 1990. These samples were also analyzed for the parameters listed above plus cyanide and phenols. During these sampling events monitoring well 3 was not sampled due to the presence of "free product (oil)" in the well. A complete copy of the Killam Associates report, including boring and monitoring well locations and analytical results of the samples collected, is included as Ref. No. 9.

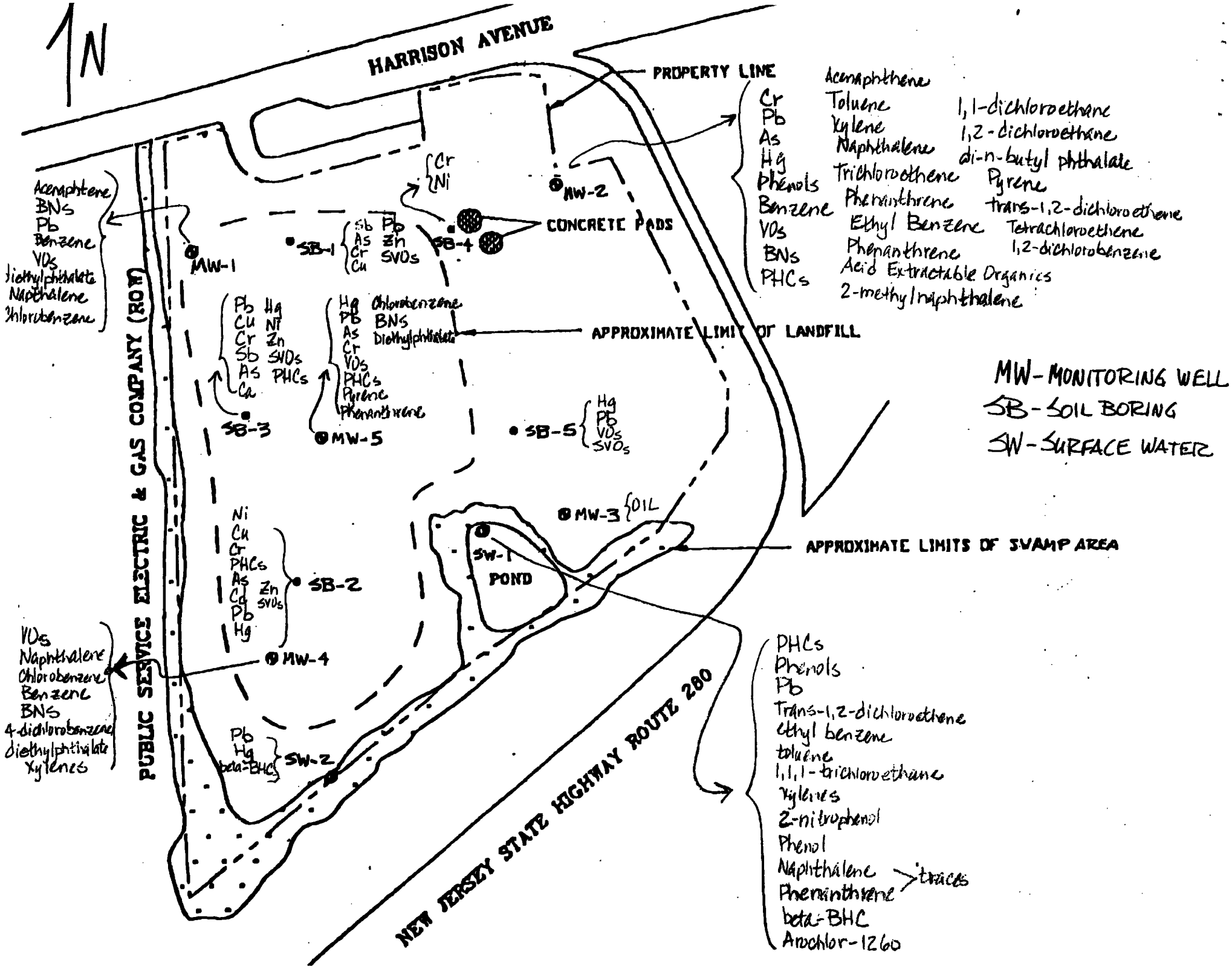
REF. 3 { Halliburton Nus conducted (for EPA) a sampling site inspection at the DHO site on July 1 and 2 1991 during which four groundwater (GW), three surface water (SW), three sediment (SED), seven surface soil (S), one subsurface soil, three liquid waste (LIQW), and two solid waste (SOLW) samples were collected.

The groundwater sample collected from monitoring well 3 had a layer of free product on top of the water. This layer was sampled as a high concentration liquid waste sample (LIQW-1,2). After purging 9 gallons of material from the well to stand for approximately 40 minutes after purging it, it was determined that a third high concentration liquid waste sample (LIQW-3) would be collected from the well. Upon standing undisturbed, sample LIQW-3 exhibited two phases. Both of these phases were analyzed independently.

REFERENCE 1



REFERENCE 2



1. The site is comprised of marsh areas and drainage ditches, a small pond , a former landfill area covered by vegetation and the location of the former Diamond Head Oil Refinery.
2. The refinery section of the site contains various types of construction debris including the concrete foundation for the former building and two concrete pads of the former above-ground storage tanks.
3. The subject site is situated in the Piedmont Plain Physiographic province which comprises the eastern half of northern New Jersey. The site lies wholly within the section of the province underlain by shale, siltstone, sandstone, conglomerate, basalt and diabase of the Triassic Period's Newark Group.
4. The site has been extensively regraded and altered as a result of the construction and demolition of the former Diamond Head Oil Refinery and the construction of a landfill within the western section of the site. As a result, the surficial geologic conditions and soil lithologies present are masked by alterations over the majority of the site. As determined during the installation of the monitoring wells and soil borings, the site soil's lithologies indicate that the site was influenced by stream deposition and/or tidal deposition of sediments during the Holocene Epoch. This is known as a veneer of Holocene deposits exists ranging in depth from 7.5 feet to 20 feet below grade. Miscellaneous fill material rests unconformably on top of these native deposits. Underlying the Holocene deposits, stratified sands of the Pleistocene Epoch are apparent.
5. The site is situated on Holocene marsh deposits, which consist of organic silt and mud with inclusions of peat. Underlying this deposits are the glacio-fluvial Pleistocene deposits which consist mainly of sand and gravels. Included in these deposits are lenses of silts and clays. Storage capacity of the fluvial deposits is apparently high. Underlying these deposits is the red shale and sandstone bedrock of the Brunswick formation. The groundwater storage capacity of this Triassic bedrock is relatively low.
6. Five monitoring wells are located on the site. Water levels taken from the wells indicate a groundwater flow from east to west with moderate perturbations due to site-specific areas of recharge. The groundwater table exists from an approximate depth of four to five feet below grade along the perimeter of the site to an approximate depth of twelve to fourteen feet in the middle portion of the site (landfill area). The hydraulic gradient across the site ranges from 0.005 to 0.015 feet/foot.
7. Screening for terrain conductivity survey and gas survey showed no areas of concern other than the presence of methane. Methane values ranged from 0 ppm to greater than 10,000 ppm (upper limit of the OVA-108, flame ionization detector) with the highest levels of methane concentrations located in the southwest quadrant of the site. In addition, the higher values were usually detected along the edges of the landfill area which coincides with a thinner layer of cover material (i.e., miscellaneous fill material covered by a veneer of sandy/silty soils).

8. Analysis of the information generated from the photoionization survey (Hnu PI-101) indicated that VOCs other than methane are present in the southeast quadrant of the site (i.e., nearest the pond; values ranging from 2-10 ppm), the northwest corner of the site (one reading at 20 ppm), the middle of the landfill area (one reading at 3 ppm), and the northeast corner of the site (values ranging from 7-250 ppm).

9. Five soil borings and five groundwater monitoring wells were installed throughout the site. Three of the soil borings (SB-1, SB-2 and SB-3) and three of the groundwater monitoring wells (MW-1, MW-4 and MW-5) were installed in the portion of the site which had been previously utilized as a landfill. Two soil borings (SB-4 and SB-5) and two groundwater monitoring wells (MW-2 and MW-3) were installed in the portion of the site which had been previously utilized by Diamond Head.

10. The investigation on the former landfill area revealed that miscellaneous fill material has been placed over native soils ranging in depth from approximately 7.5 feet (northern side of site) to approximately 18 feet (southern side of site). The fill generally consisted of brick fragments, glass, plastic, wood, cinders, and other miscellaneous materials all of which one would typically expect to encounter in an area utilized for landfilling of domestic solid waste. However, visual and olfactory indications of extensive petroleum contamination were also noted to be present throughout this portion of the site. Also noted were indications of the presence of methane gas as well as low levels of VOCs.

11. The investigation on the Diamond Head portion of the site also revealed the presence of fill material. This fill material, however, appears unrelated to the disposal of municipal refuse, rather it is indicative of the placement of non-native soils. This likely occurred previously to fill in low lying land so that the area could be developed and utilized for commercial purposes. Visual and olfactory indications of extensive petroleum contamination were also noted to be present throughout this portion of the site. Also noted, based on OVA readings obtained during this phase of the investigation, were indications of the presence of methane gas as well as low levels of VOCs.

12. Nine soil samples, two surface water samples and eight groundwater samples (two rounds) were taken. The soil samples were analyzed for PHCs and USEPA Priority Pollutants plus 40 library search compounds (PP+40). The groundwater samples were analyzed for cyanide and phenols in addition to the aforementioned parameters. It should be noted that each surficial soil sample was subject to PP+40 analysis except for the volatile organic (VO+15) fraction which was performed on soil from the 18 to 24 inch interval.

13. Soil Analyses

PHCs were not detected in SB-1, SB-4, or SB-5; but were detected in SB-2 and SB-3. The concentrations detected varied with depth, and ranged from 130 to 2400 ppm.

Priority Pollutant Metals. *Antimony* was detected in excess of the guideline of 2 ppm in samples retrieved from SB-1 6-6.5 feet (6.8 ppm) and SB-3 7-7.85 feet (2.9 ppm).

Arsenic was detected in excess of the guideline of 20 ppm in soil samples from SB-1, SB-2, and SB-3. SB-1 6-6.5 feet (38.1 ppm); SB-2 0-0.5 feet (20.9) and 10.4-10.9 feet (25 ppm); SB-3 7-7.85 feet (28.9 ppm). *Cadmium* was detected in all of the soil samples from SB-2 and SB-3 (3.6-6.2 ppm). *Chromium* was found in all but three of the samples (SB-1 0-0.5 feet, SB-2 0-0.5 feet and SB-5) in concentration ranging from 158 to 4000 ppm. *Copper* was found in all but three of the samples (SB-1 0-0.5 feet, SB-4, and SB-5) in concentrations ranging from 264 to 767 ppm. All but two of the samples (SB-1 6-6.5 and SB-4) exhibited concentrations of *lead* ranging from 359 to 1350 ppm. All of the samples from SB-2, SB-3, and SB-5 exhibited concentrations of *mercury* ranging from 1.36 to 2.28 ppm. *Nickel* was found in four of the samples (SB-2, SB-3 0-0.5 feet, and SB-4) in concentrations ranging from 104 to 644 ppm. All samples (but SB-4 and SB-5) exhibited concentrations of *Zinc* ranging from 508 to 1140 ppm.

Volatile Organics. One sample, SB-5, exhibited a total concentration of 1.039 ppm.

Semivolatile Organics. All samples (but SB-1 6-6.5 feet and SB-4) exhibited total concentrations ranging from 13.249 to 272.57 ppm.

14. **Groundwater analyses - Nov. 1989**

Groundwater samples were collected from monitoring wells MW-1, MW-2, MW-4, and MW-5. A duplicate sample was collected from MW-4. No sample was collected from MW-3 due to the presence of a free product (oil) in the well.

PHCs, Cyanide and Phenols. *PHCs* were detected in MW-2 and MW-5 at concentrations of 2.8 and 14 ppm, respectively. The sample from MW-2 exhibited a concentration of 4.66 ppm of *phenols*.

Priority Pollutant Metals. Groundwater collected from MW-5 exhibited a concentration of 0.051 ppm of *arsenic*. Samples from MW-2 and MW-5 exhibited concentrations of *chromium* of 19.3 and 0.403 ppm, respectively. Samples collected from MW-1, MW-2, and MW-5 exhibited *lead* at concentrations of 0.075, 2.86, and 1.52 ppm, respectively. Samples from MW-2 and MW-5 exhibited concentrations of *mercury* at 0.003 and 0.016 ppm, respectively.

Volatile Organics. The following compounds were detected in the groundwater samples collected in excess of 0.005 ppm: benzene (MW-1, MW-2, MW-4); chlorobenzene (MW-1, MW-4, MW-5); 1,1-dichloroethane (MW-2); trans-1,2-dichloroethene (MW-2); ethyl benzene (MW-2); tetrachloroethene (MW-2); toluene (MW-2); trichloroethene (MW-2); xylenes (MW-2). Also, all of the groundwater samples collected exhibited concentrations of VOs in excess of 0.010 ppm.

Acid Extractable Organics. The groundwater sample collected from MW-2 exhibited a total concentration of targeted compounds of 2.23 ppm.

Base Neutral Extractable Organics. The following targeted BN compounds were detected in excess of 0.005 ppm: 1,4-dichlorobenzene (MW-4); 1,2-dichlorobenzene (MW-2); naphthalene (MW-1, MW-2, MW-4); acenaphthene (MW-1, MW-2); diethylphthalate (MW-4); phenanthrene (MW-2, MW-5); pyrene (MW-2, MW-5). Also, three wells (MW-2, MW-4, MW-5), exhibited total concentrations of targeted BNs in excess of 0.050 ppm.

15. Groundwater analyses - Jan. 1990

Groundwater samples were collected from monitoring wells MW-1, MW-2, MW-4, and MW-5. A duplicate sample was collected from MW-1. No sample was collected from MW-3 due to the presence of a free product (oil) in the well.

PHCs, Cyanide and Phenols. *PHCs* were detected in MW-2 at a concentration of 5 ppm. The sample collected from MW-2 exhibited a concentration of *phenols* of 4 ppm.

Priority Pollutant Metals. Groundwater collected from MW-2 exhibited a concentration of 0.060 ppm of *arsenic*. Samples from MW-2 exhibited a concentration of *chromium* of 23 ppm. Samples collected from MW-2 and MW-5 exhibited concentrations of *lead* of 0.76 and 0.70 ppm, respectively. One sample collected from MW-5 exhibited a concentration of *mercury* at 0.008 ppm.

Volatile Organics. The following compounds in excess of 0.005 ppm were detected in the groundwater samples collected: benzene (MW-1, MW-2, MW-4); chlorobenzene (MW-1, MW-4, MW-5); 1,2-dichloroethane (MW-2); trans-1,2-dichloroethene (MW-2); ethyl benzene (MW-2); xylenes (MW-2, MW-4). Also, all of the groundwater samples collected exhibited concentrations of VOs in excess of 0.010 ppm.

Acid Extraction Organics. The groundwater sample collected from MW-2 exhibited a total concentration of targeted compounds of 2.5 ppm.

Base Neutral Extractable Organics. The following BN compounds were detected in excess of 0.005 ppm: 1,2-dichlorobenzene (MW-2); diethylphthalate (MW-1, MW-4, MW-5), di-n-butyl phthalate (MW-2); 2-methylnaphthalene (MW-2); naphthalene (MW-2); phenanthrene (MW-2). Also, two wells, MW-1 and MW-2, exhibited total concentrations of targeted BNs in excess of 0.05 ppm.

16. Surface Water Analyses

Surface water samples were collected from two locations on the site

PHCs, Cyanide and Phenols. *PHCs* were detected in SW-1 at a concentration of 36.2 ppm. *Phenols* were detected in SW-1 at a concentration of 0.644 ppm.

Priority Pollutant Metals. *Lead*, at both locations, and *mercury*, at SW-2, were above standard guideline values.

Volatile Organics. Analysis of SW-1 indicated that trans-1,2-dichloroethene, ethyl benzene, toluene, 1,1,1-trichloroethane, and xylenes were present at concentrations of 0.012, 0.010, 0.075, 0.006, and 0.055 ppm, respectively.

Acid Extractable Organics. 2-nitrophenol and phenol at concentrations of 0.082 and 0.180 ppm were detected in SW-1

Base Neutral Extractable Organics. Naphthalene and phenanthrene were detected in SW-1 at trace concentrations.

Pesticides/PCBs. Both SW-1 and SW-2 exhibited the presence of beta-BHC, a pesticide compound, at concentrations of 0.006 and 0.003 ppm, respectively. SW-1 also exhibited the presence of Arochlor-1260, a PCB, at concentration of 0.0069 ppm.

6.0 CONCLUSIONS

Based upon the conductance of an environmental site characterization of the HMURDC property, located in Kearny, NJ, the following has been revealed:

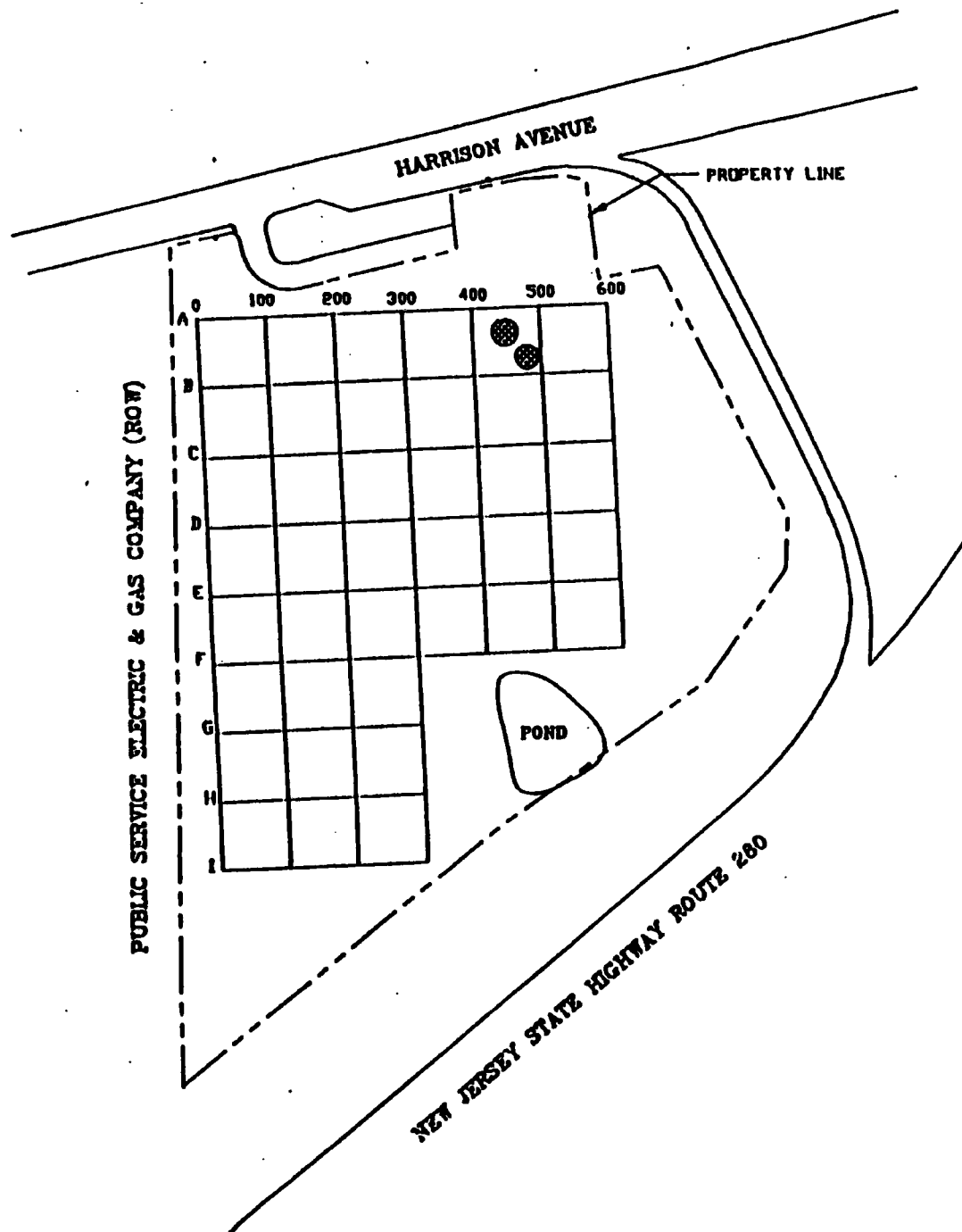
*The conductance of a terrain conductivity survey revealed no anomalies which would suggest or indicate the presence of buried metallic objects (e.g. drums, tanks etc.).

*The conductance of a soil gas survey indicated that methane is currently being produced at the site. The highest levels of methane were detected in the southwest quadrant of the site. Isolated areas of the site, also appear to contain other volatile organic compounds.

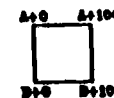
*Through the installation of soil borings and the obtaining of soil samples it has been revealed that eastern portion of the site (previously utilized for landfill operations) has had miscellaneous fill material placed over the original soils ranging in depth from approximately 7.5 feet to approximately 18 feet. The fill was noted to generally consist of brick fragments, glass, plastic wood cinders and other miscellaneous materials one would typically expect to encounter in an area utilized for landfilling of domestic solid waste. Also noted, however, were visual and olfactory indications of extensive petroleum contamination. The western portion of the site (location of an oil recycling facility) was also noted to contain the presence of fill material. This fill material, however, appears unrelated to the disposal of municipal refuse, rather it is indicative of the placement of non-native soils. The presence of extensive petroleum contamination was also noted on this portion of the site.

*Through the laboratory analysis of soil samples, collected from the site, PHCs, several priority pollutant metals, total volatile organics and total semivolatile organics were all noted, at various locations throughout the site, to be above NJDEP guideline values. None of the soil samples analyzed exhibited concentrations of pesticides or PCBs above the NJDEP guideline values.

*Through the laboratory analysis of two rounds of groundwater samples, collected from the site, PHCs, phenols, several priority pollutant metals, total and individual concentrations of volatile organics, total acid extractable organics and total and individual concentrations of base neutral compounds were all noted, at various locations throughout the site, to be above NJDEP guideline values. None of the ground water samples analyzed exhibited concentrations of cyanide, pesticides or PCBs above the NJDEP guideline values.



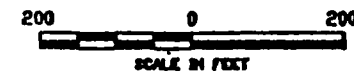
LEGEND



SURVEY GRID WITH TYPICAL STATION NUMBER

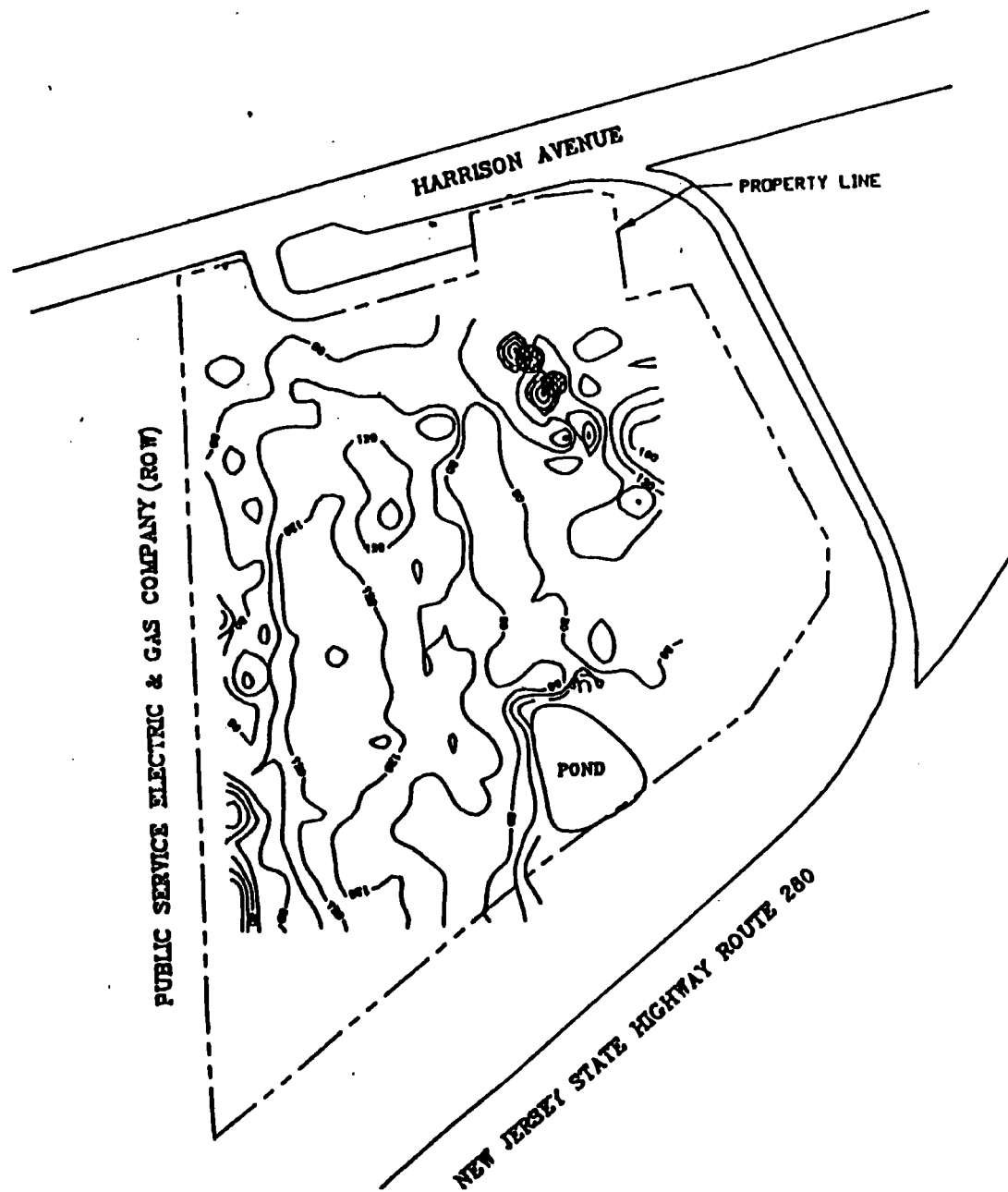


CONCRETE PAD



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TERRAIN CONDUCTIVITY/SOIL GAS
SURVEY GRID



LEGEND

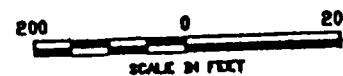


TERRAIN CONDUCTIVITY CONTOUR LINE
(millimhos/meter)



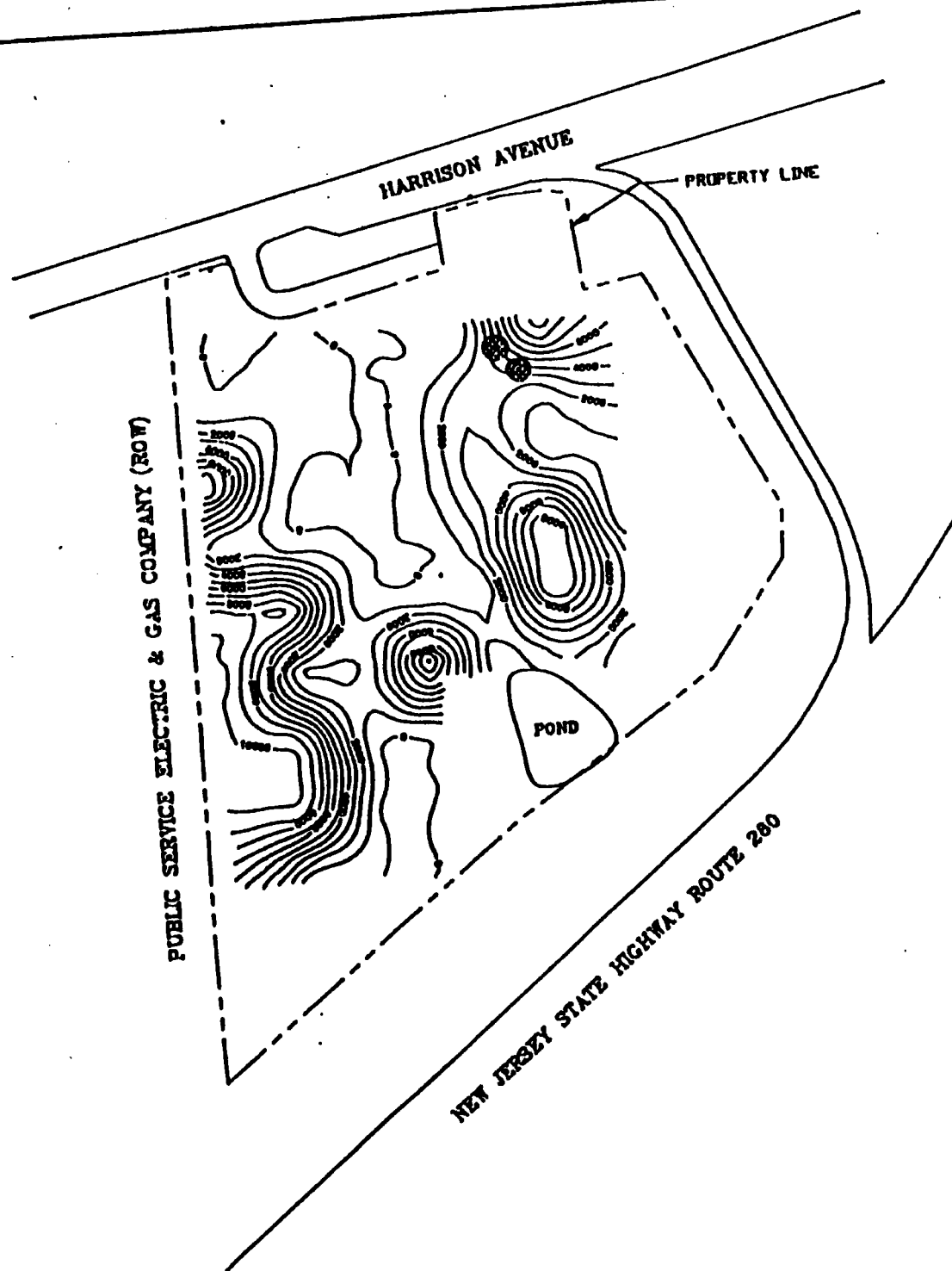
CONCRETE PAD

CONTOUR INTERVAL = 20 millimhos/meter



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TERRAIN CONDUCTIVITY SURVEY



LEGEND

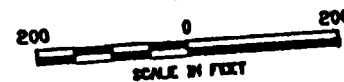
— 4000 —

METHANE ISOCONCENTRATION CONTOUR LINE
(PARTS PER MILLION)



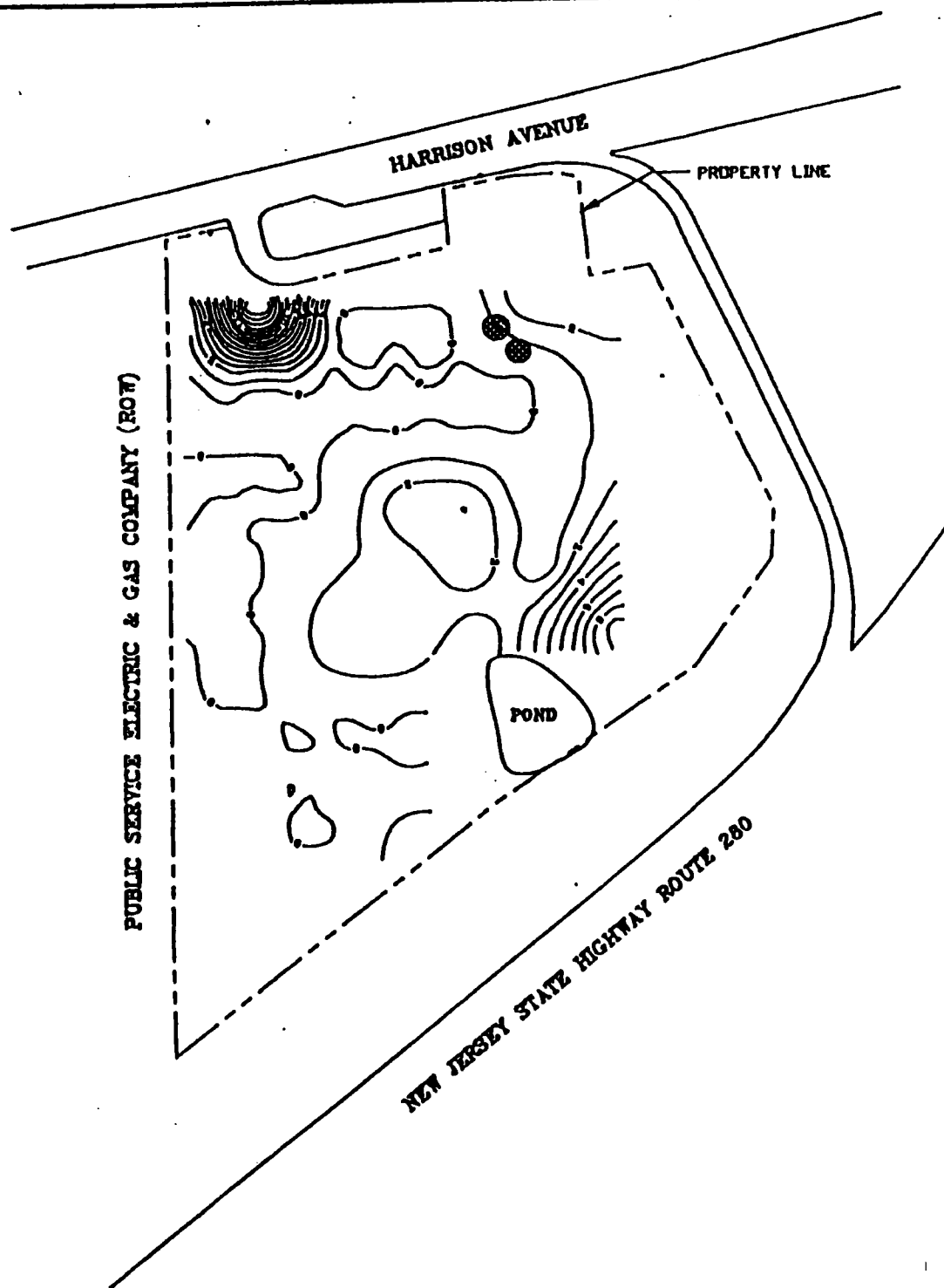
CONCRETE PAD

CONTOUR INTERVAL = 1000 PARTS PER MILLION



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SOIL GAS SURVEY
CONCEPTUAL METHANE GA
CONTOUR MAP



LEGEND

- - - VOLATILE ORGANIC COMPOUNDS
ISOCONCENTRATION CONTOUR LINE (ppm)

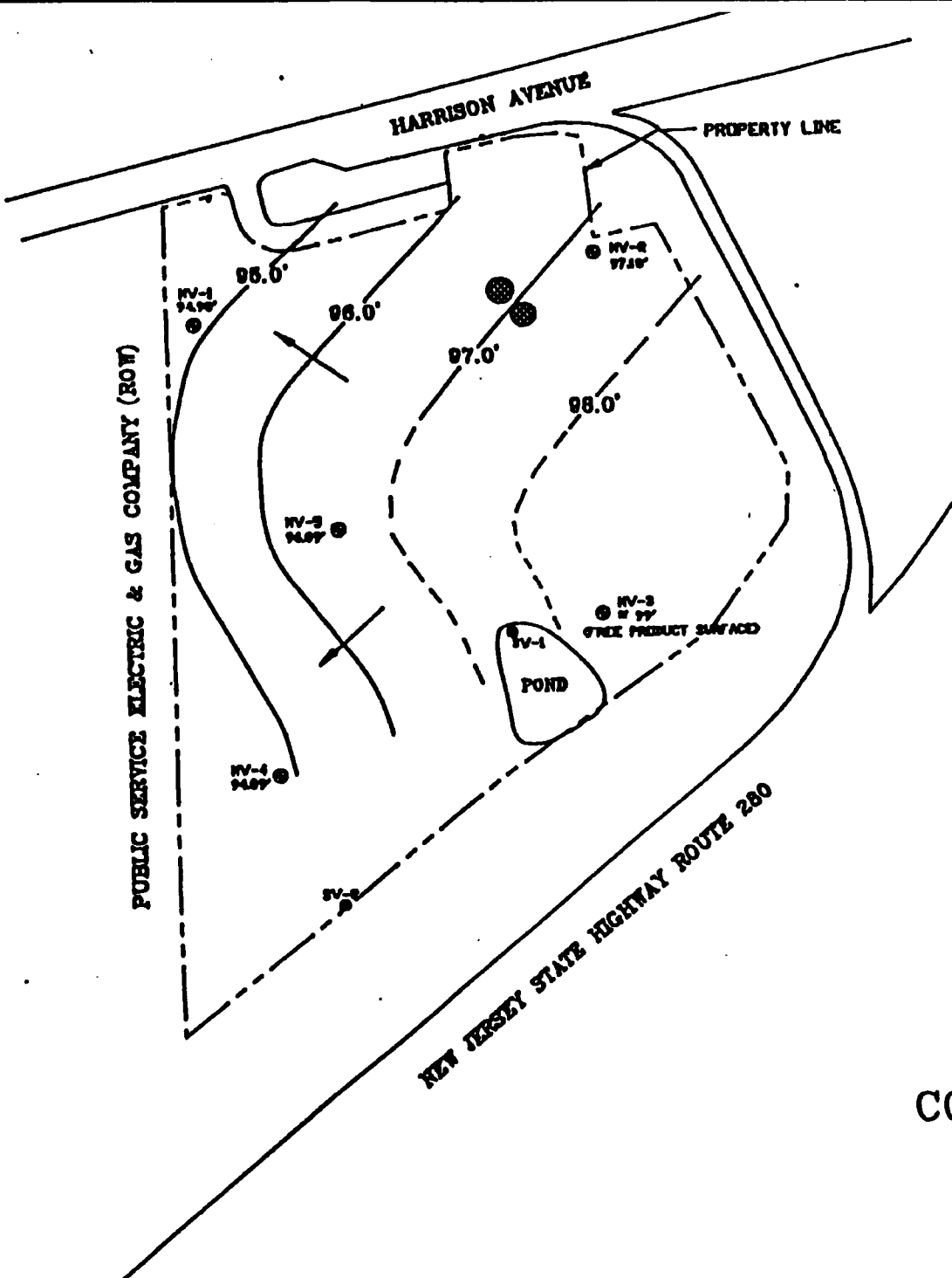
● CONCRETE PAD

CONTOUR INTERVAL = 1 PART PER MILLION

200 0 200
SCALE IN FEET

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SOIL GAS SURVEY
CONCEPTUAL VOLATILE ORGANIC
COMPOUNDS CONTOUR MAP

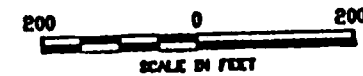


LEGEND

- NV-1 94.97' ● EXPLORATORY GROUNDWATER MONITORING WELL
- SV-1 ● SURFACE WATER SAMPLING LOCATION
- /— LINE OF EQUAL POTENTIOMETRIC HEAD
- GROUNDWATER FLOW DIRECTION
- CONCRETE PAD

CONTOUR INTERVAL = 1 FOOT
(DASHED WHERE INFERRED)

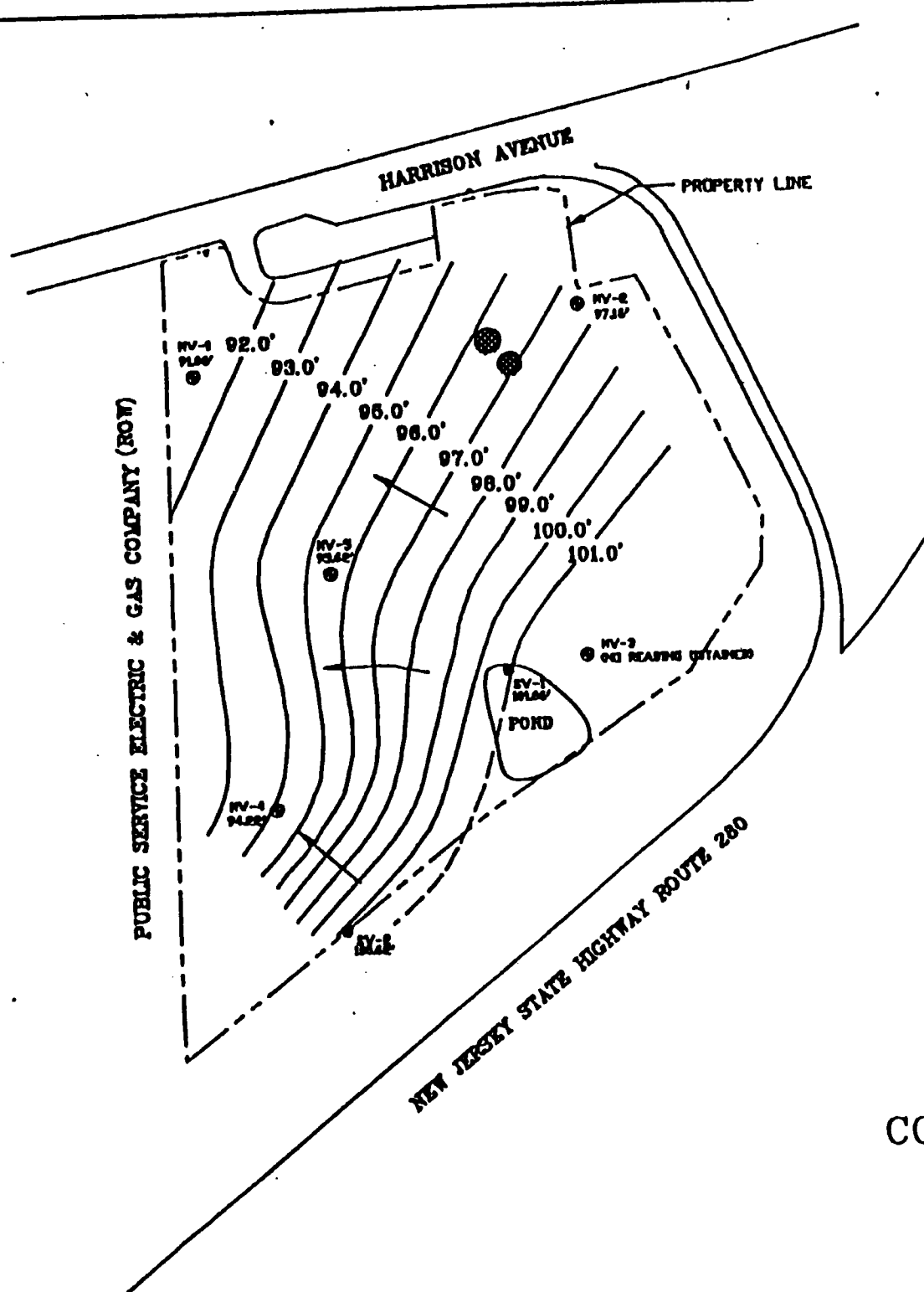
ELEVATIONS RELATIVE TO
SITE SPECIFIC DATUM = 100 FEET



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CONCEPTUAL GROUNDWATER CONTOUR MAP
NOVEMBER 14, 1989

FIGURE 7

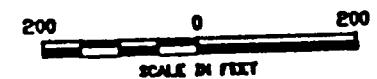


LEGEND

- MV-1 92.0' ● EXPLORATORY GROUNDWATER MONITORING WELL
- SV-1 101.0' ● SURFACE WATER SAMPLING LOCATION
- LINE OF EQUAL POTENTIOMETRIC HEAD
- GROUNDWATER FLOW DIRECTION
- CONCRETE PAD

CONTOUR INTERVAL = 1 FOOT
(DASHED WHERE INFERRED)

ELEVATIONS RELATIVE TO
SITE SPECIFIC DATUM = 100 FEET

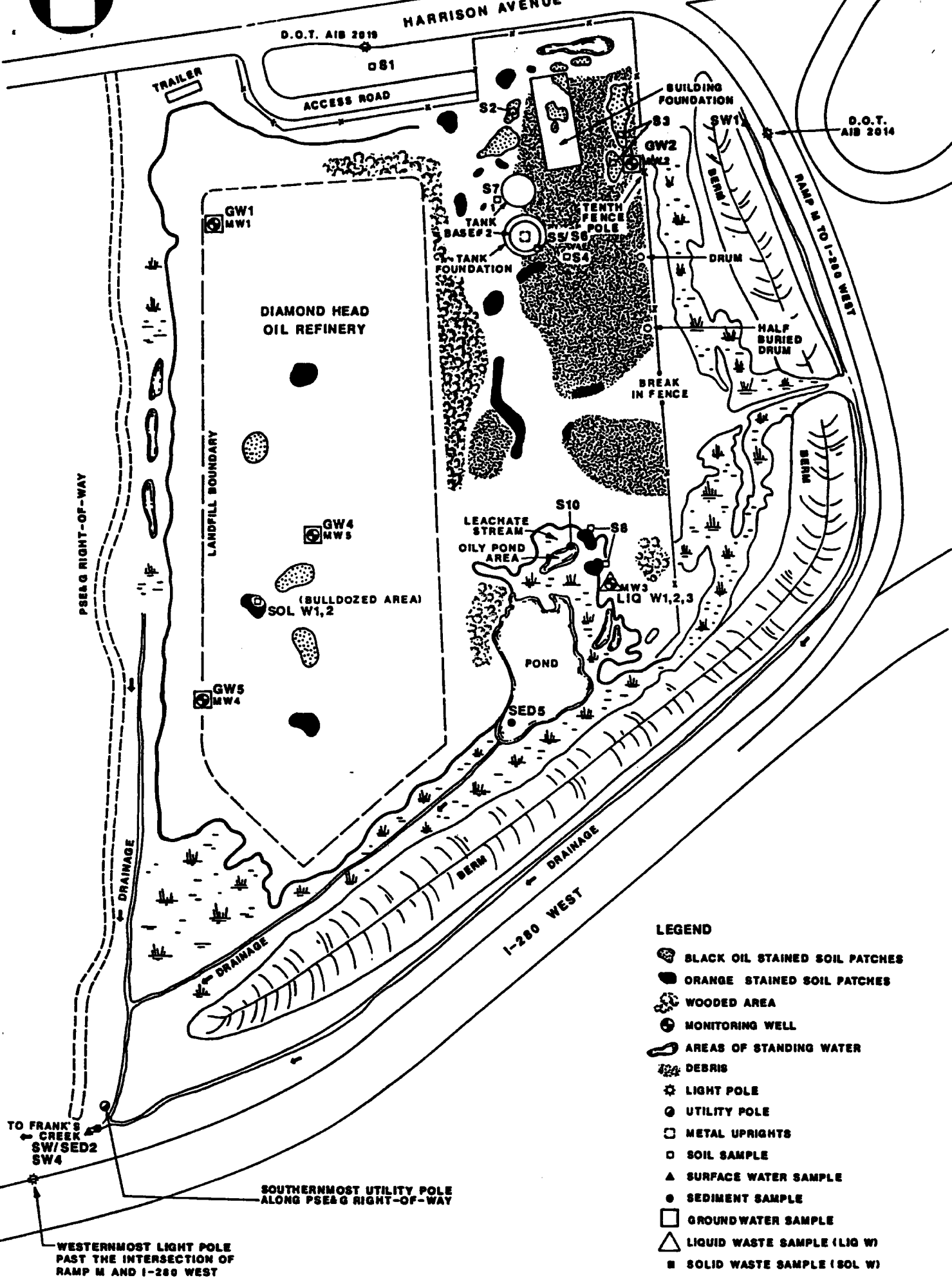


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CONCEPTUAL GROUNDWATER CONTOUR
JANUARY 18, 1990

FIGURE 8

REFERENCE 3



SAMPLE LOCATION MAP

FIGURE 3

NOTES:

Blank space - compound analyzed for but not detected

E - estimated value

J - estimated value, compound present below CRDL but above IDL

R - analysis did not pass EPA QA/QC

NR - analysis not required

Volatiles µg/l	SW1	SW2(DUP)	SW4
Chloromethane	3J		
Chloroethane		3J	4J
Acetone	44E	15E	
Carbon Disulfide		3J	2J
Benzene		1J	1J
Toluene		6E	4J
Semi-Volatiles			
Bis(2-Ethylhexyl)phthalate		9J	6J
Inorganics			
Aluminum	R	R	R
Antimony	J	J	106E
Arsenic	J	J	20
Barium	J	305E	711E
Cadmium	J	J	16E
Calcium	39800E	111000E	147000E
Chromium	14.8E	27E	94.1E
Cobalt	J	J	J
Copper	44.9E	59.9E	293E
Iron	7330E	22400E	90600E
Lead	24	59.7	324
Magnesium	14300E	34100E	38500E
Manganese	281E	762E	1560E
Nickel	J	J	J
Potassium	6430E	19600E	21100E
Selenium	J		J
Sodium	33000E	125000E	126000E
Vanadium	J	J	J
Zinc	167E	229E	1210E
Cyanide		12	12

Volatiles	SED2	SED5
µg/kg		
Acetone		140E
Carbon Disulfide		7J
Pesticides		
µg/kg		
Alpha-BHC		56E
Beta-BHC		130E
4,4'-DDE		100EN
4,4'-DDD	28EN	390EN
4,4'-DDT	R	260E
Alpha-chlordane		190E
Inorganics		
mg/kg		
Aluminum	1600	8200
Antimony	J	J
Arsenic	2.7	15.4
Barium	J	327
Beryllium		J
Cadmium	J	5.7
Calcium	2520	4740
Chromium	11.6E	92E
Cobalt	J	J
Copper	35.1	339
Iron	7250	19300
Lead	38.1	905
Magnesium	J	2470
Manganese	79.7	318
Mercury	R	R
Nickel	J	53.2
Potassium	J	J
Selenium		J
Silver		J
Sodium	J	J
Vanadium	J	32.1E
Zinc	88.2	770

Volatiles µg/l	GW1	GW2	GW4	GW5
Vinyl chloride		12		
Acetone		940E	43B	
1,1-Dichloroethene		1J		
1,1-Dichloroethane		21		
Trans-1,2-Dichloroethene (total)		18		
2-Butanone		170E		
1,1,1-Trichloroethane		1J		
Trichloroethene		11		
Benzene	11	30		20
2-Hexanone		25		
4-Methyl-2-Pentanone		98		
Tetrachloroethene		3J		
Toluene		160		1J
Chlorobenzene	18		10	160
Ethylbenzene		23		
Xylenes (Total)		140		5J
Semi-Volatiles				
µg/l				
1,4-Dichlorobenzene	2J			6J
1,2-Dichlorobenzene		7J		
2-Methylphenol		310		
4-Methylphenol		900		
2,4-Dimethylphenol		390		
Benzoic Acid		130		
Naphthalene	22	39		2J
2-Methylnaphthalene	5J	22		
Acenaphthene	10J	4J		2J
Fluorene	3J			
Pentachlorophenol	5J			
Phenanthrene		3J	3J	
Fluoranthene			3J	
Pyrene			3J	
Bis(2-Ethylhexyl)phthalate			5J	

Pesticides µg/l	GW1	GW2	GW4	GW5
Alpha-BHC			R	
Gamma-BHC (Lindane)			R	
Heptachlor			R	
Aldrin			R	
Heptachlor epoxide			R	
Endosulfan I			R	
Endrin			R	
Inorganics µg/l				
Aluminum	R	R	R	R
Antimony	109E	J	99.6E	111E
Arsenic	J	46	14	J
Barium	J	J	970E	583E
Cadmium	5.5E	J	7.6E	6.4E
Calcium	135000E	J	133000E	78300E
Chromium	29E	4720E	81.2E	R
Cobalt	J	J	J	J
Copper	J	39.1E	170E	J
Iron	34100E	714E	35200E	41200E
Lead	22	274	319	25.1
Magnesium	99400E	J	73400E	92900E
Manganese	624E	J	182E	191E
Mercury			2.2E	
Nickel	J	123E	61.6E	J
Potassium	46100E	15900E	47000E	96400E
Selenium		J	J	
Silver			J	J
Sodium	190000E	636000E	238000E	363000E
Vanadium	J	1870E	J	J
Zinc	43.7E	646E	588E	141E
Cyanide	7.5	15.5	30	

Volatiles µg/l	LIQW1	LIQW2 (DUP)	LIQW3	LIQW3
Benzene	6J		6J	
Toluene	105E	97	105	
Ethylbenzene	92E	90	90	
Xylenes (Total)	542E	514	208	
Semi-Volatiles µg/l				
1,2-Dichlorobenzene	34J	37J	30J	
Naphthalene	229	232	226	
2-Methylnaphthalene	427	406	427	
3-Nitroaniline	R	R	R	R
Acenaphthene	23J	23J		
Fluorene		32J		
4-Nitroaniline	R	R	R	R
Alpha-BHC			132	
Phenanthrene	124	117	106	
Fluoranthene	119	91J	111	
Pyrene	100	109	105	
Endosulfan I	R	R	R	R
Endosulfan II	R	R	R	R
Endrin ketone	R	R	R	R
Methoxychlor			68J	
Pesticides µg/l				
Arochlor-1016	16E	16E	16E	
Arochlor-1260	21E	20E	21E	
Inorganics mg/kg				
Aluminum	R	R	R	
Arsenic	3J	2.3J	R	
Barium	831.4	778	882	
Beryllium	7.2E	9.8	1J	
Cadmium	6.9J	10.2E		
Calcium	1528	1958	2357	
Chromium	83.1E	74.3E	78.3E	

Inorganics (cont.) mg/kg	LIQW1	LIQW2 (DUP)	LIQW3	LIQW3
Cobalt		8.3J		
Copper	29.2J	30.2J	63.4E	
Iron	333	302	518	
Lead	390	380	621	
Magnesium	187E	94.8E	212E	
Manganese	25.7	29.3	21.4	
Silver	6.2J	5.3J	12.2E	
Sodium	304	203	470	
Vanadium	47	46	80.7	
Zinc	17.5J	33	197	
Cyanide	R	R	R	
Cyanide (oil phase)	N/A	N/A	R	

Volatiles µg/l	SOLW1	SOLW2(DUP)
Methylene chloride	2J	1J
Acetone		2J
Semi-Volatiles µg/l		
3-Nitroaniline	R	R
Endosulfan I	R	R
Endosulfan II	R	R
Endrin ketone	R	R
Inorganics ppm		
Aluminum	33635	63595
Antimony	34.3	
Arsenic	25.5	26
Barium	515	717
Beryllium	61.1E	
Cadmium	57.8E	
Calcium	7462	5328
Chromium	156	113
Cobalt	15J	
Copper	523E	283E
Iron	19691	31227
Lead	511	616
Magnesium	5570	6706
Manganese	296	299
Mercury	1.4E	1.58E
Nickel	111E	108E
Silver	51.9E	
Sodium	10618	8222
Vanadium	106E	44E
Zinc	853	740
Cyanide (oil phase)	N/A	N/A

Volatiles µg/kg	S1	S2	S3	S4
Vinyl chloride				10J
Acetone		59E		
1,1-Dichloroethane		12E		22J
Trans-1,2-Dichloroethene (total)		24E		53
2-Butanone				71E
1,1,1-Trichloroethane				9J
Trichloroethene				46
Benzene		10E		550
2-Hexanone		210E		
4-Methyl-2-Pentanone		110E		230
Tetrachloroethene		21E		99
Toluene		300E		840
Ethylbenzene		39E		830
Xylenes (Total)		590E		2700
Semi-Volatiles µg/kg				
Acenaphthylene	140J			
Phenanthrene	490J			24000J
Antracene	140J			24000J
Fluoranthene	880E			
Pyrene	790E			55000J
Benzo(a)anthracene	480J			
Chrysene	540J			
Bis(2-Ethylhexyl)phthalate	160J			
Benzo(b)fluoranthene	620J			
Benzo(k)fluoranthene	660J			
Benzo(a)pyrene	630J			
Indeno(1,2,3-cd)pyrene	390J			
Dibenz(a,h)anthracene	160J			
Benzo(g,h,i)perylene	460J			
Pesticides µg/kg				
Beta-BHC				1100E
4,4'-DDE		140EN		
Endrin				220E
4,4'-DDT	25E	R		1300E
Alpha-chlordane				630J
Arochlor-1260	700E			28000E

Inorganics ppm	S1	S2	S3	S4
Aluminum	5720	6000	3980	10000
Antimony	16.2E	17.3E	41.7E	39.4E
Arsenic	7.6	58.7	10.4	7.4
Barium	114	114	609	464
Beryllium	J	J		J
Cadmium	9.3	2.6E	4.3	4.9
Calcium	12500	35600	1750	66000
Chromium	56.8E	407E	91.1E	1390E
Cobalt	J	17.7	J	58.5
Copper	137	119	162	107
Iron	21300	18300	64400	32400
Lead	205	271	4720	5140
Magnesium	2310	6810	1410	23400
Manganese	263	381	74.5	1040
Mercury	R	R	R	R
Nickel	22.7	63.3	38.8	207
Potassium	J	J	J	J
Selenium	J	J	J	J
Silver	J	J		4.2
Sodium	J	J	J	J
Thallium		J		
Vanadium	25.4E	143E	22.4E	515E
Zinc	559	564	166	2010
Cyanide	J	J	1.5	0.92

Volatiles µg/kg	S5	S6(DUP)	S7	S8
Acetone	1100E			
Trans-1,2-Dichloroethene (total)	8J	14J		
2-Butanone	81E	100E		
2-Hexanone	1800E	1500E		
Tetrachloroethene	170E	270E		
Toluene			26J	3J
Chlorobenzene	71E			
Ethylbenzene	17E		46	3J
Xylenes (Total)	120E		320	31E
Semi-Volatiles				
µg/kg				
Naphthalene	660000E	330000J		
2-Methylnaphthalene	370000E	160000J		
Acenaphthylene	180000J	110000J		
Acenaphthene	68000J			
Fluorene	110000J			
Phenanthrene	400000E	190000J		
Anthracene	120000J	59000J		
Fluoranthene	210000J	140000J		
Pyrene	410000E	290000J		
Benzo(a)anthracene	97000J			
Chrysene	93000J			
Bis(2-Ethylhexyl)phthalate	110000J			
Benzo(b)fluoranthene	58000J			
Benzo(k)fluoranthene	70000J			
Benzo(a)pyrene	140000J	93000J		
Indeno(1,2,3-cd)pyrene	49000J			
Benzo(g,h,i)perylene	78000J			
Pesticides				
µg/kg				
Alpha-BHC				210E
Delta-BHC		220E		
Endrin	2000E	1900E	61E	
4,4'-DDD				260EN
4,4'-DDT				30E
Arochlor-1260	110000E	110000E		

Inorganics ppm	S5	S6(DUP)	S7	S8
Aluminum	7170	8190	22900	4430
Antimony	54.3E	69.1E	19.6E	J
Arsenic	12.5	12	J	11.5
Barium	4630	4280	54.3	2000
Beryllium				J
Cadmium	21.7	23	2.4	4.9
Calcium	20600	25600	33100	8790
Chromium	562E	776E	986E	103E
Cobalt	51.2	63.5	51.8	J
Copper	1080	1020	31.1	161
Iron	45200	63500	21600	11600
Lead	53300	52300	161	8110
Magnesium	13100	17500	20300	2310
Manganese	417	515	200	191
Mercury	R	R	R	R
Nickel	197	266	190	25.6
Potassium	J	J	J	J
Selenium	J			J
Silver	86.6	88.5		J
Sodium	J	J	J	J
Thallium	J			
Vanadium	291E	411E	639E	23.6E
Zinc	5550	4940	171	1040
Cyanide	2.9	2.7	4.2	J

Volatiles	S10
µg/kg	
1,1-Dichloroethene	66E
1,1-Dichloroethane	410E
Trans-1,2-Dichloroethene (total)	260E
1,1,1-Trichloroethane	3200E
Trichloroethene	2200E
Benzene	890E
2-Hexanone	6100E
4-Methyl-2-Pentanone	3600E
Tetrachloroethene	25000E
Toluene	48000E
Ethylbenzene	24000E
Xylenes (Total)	100000E

Semi-Volatiles

µg/kg	
Naphthalene	130000J
2-Methylnaphthalene	310000J

Inorganics

ppm	
Aluminum	1940
Antimony	53.7E
Arsenic	10.9
Barium	2440
Cadmium	31
Calcium	27500
Chromium	147E
Cobalt	J
Copper	480
Iron	7870
Lead	76200
Magnesium	7340
Manganese	351
Mercury	R
Nickel	19.3
Potassium	J
Silver	J
Sodium	4770E
Vanadium	J
Zinc	18400
Cyanide	1